

PATENT CLAIMS

1. Device for carrying out gas reactions, comprising a plasma reactor with a through-flow of gases which has a plasma chamber, particularly a cylindrical plasma chamber, wherein flow-forming elements for forming the flow of gases are arranged before and/or in and/or after the plasma reactor in order to form a gas stream within the plasma chamber such that at least one, particularly central, zone in the gas flow is formed which is flow-reduced, characterized in that said flow-forming elements are arranged so as to be adjustable.

2. Device according to claim 1, characterized in that the flow-forming elements arranged in the gas stream are configured as cones, drops, annular gaps, diaphragms, grids, baffle bodies, vortex tubes, cyclones or turbines.

3. Device according to any one of the preceding claims, characterized in that a reaction tube is arranged axially after the reactor.

4. Device according to any one of the preceding claims, characterized in that cooling chambers are arranged at the inlet and/or outlet of the reactor and/or in and/or on the wall of the reaction tube.

5. Device according to any one of the preceding claims, characterized in that feed elements, particularly nozzles, slots or tubes, are provided for introduction of cooling medium, particularly cold gases, liquid substances or part of the starting materials.

6. Device according to claim 5, characterized in that the feed elements form flow-forming elements.

7. Device according to any one of the preceding claims, characterized in that catalysts are arranged in the reaction tube, in particular so as to be displaceable, said catalysts in particular being heterogeneous catalysts on bottoms, in a basket, or as a monolith.

8. Method for carrying out gas reactions by passing a stream of gas or of gasifiable substances through a microwave-excited plasma in a plasma chamber of a plasma reactor, particularly a non-equilibrium plasma, in order to convert the components, particularly in a device according to any one of the preceding claims, characterized in that by means of adjustable flow-forming elements at least one flow-reduced zone is formed in the gas stream in order to produce a stable plasma within such a zone.

9. Process according to claim 8, characterized in that by means of the flow-forming elements a rotation of the gas stream is achieved.

10. Process according to any one of the preceding claims, characterized in that heat is recovered by means of a heat exchanger integrated in the reaction tube, in particular by using a black exchange surface for exploitation of the radiation energy.

11. Process according to any one of the preceding claims, characterized in that gases or aerosols, particularly hydrogen, are introduced via nozzles in order to control the temperature, in particular in the reaction or recombination zone, and in particular in order to achieve a more effi-

cient activation after the plasma by means of the feeds
(3).

12. Process according to any one of the preceding claims, characterized in that the plasma is pulse-operated, particularly by pulsed control of the microwave generator and/or pulsed coupling of the microwaves into the resonator, particularly at pulse frequencies from 1 Hz to 50 kHz.